

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings of claims in the application:

LISTING OF CLAIMS:

Claims 1-62 (Cancelled)

63. (Previously Presented) An in-line continuous substrate flow production apparatus for fabrication of copper indium gallium diselenide (CIGS) solar cells comprising a CIGS process chamber in which substrates provided with a molybdenum back contact layer continuously move through a deposition zone (DZ) in the CIGS process chamber, the process chamber comprising a plurality of separated heating elements, wherein at least one sensor is arranged in deposition zone and connected to a controller, the sensor being adapted to measure a physical parameter related to a transformation of the deposited CIGS film from a Cu-excessive composition to a Cu-deficient composition, said transformation taking place at a reference transition point in the process chamber as the substrate moves through the process chamber, the sensor being arranged to detect a shift of the actual transition point on the moving substrate from the reference transition point by measuring the physical parameter at

the deposited CIGS film at the reference transition point, the controller being adapted to receive as input the sensor output signal and to deliver as output a corrective signal that adjusts the evaporant fluxes so that the actual transition point is brought back to the reference transition point.

64. (Previously Presented) An in-line production apparatus in accordance with claim 63, wherein two sensors, together forming a sensor pair, are arranged at each side of the transition point, that each sensor in the pair is connected to a respective input of the controller, said sensor pair being arranged in a row with the evaporation sources.

65. (Previously Presented) An in-line production apparatus in accordance with claim 63, wherein a device for detecting the deposited amount of constituents of the CIGS film is provided in the CIGS process chamber.

66. (Previously Presented) An in-line production apparatus in accordance with claim 63, wherein a sensor pair is associated with an individual set of evaporation sources, and the two sensor pairs are arranged at different locations as seen in a direction over the width of the

process chamber, that each sensor pair and its associated set of evaporation sources are arranged in a respective row, and that each sensor pair and set of evaporation sources of a row is connected to a respective controller so as to adjust the evaporation flows in each evaporation set.

67. (Previously Presented) An in-line production apparatus in accordance with claim 66, wherein there are two rows each one comprising a set of evaporation sources, the two rows of evaporation sources are arranged at each side of and outside the path along which substrates flow through the deposition chamber.

68. (Previously Presented) An in-line production apparatus in accordance with claim 66, wherein a device for detecting the deposited amount of constituents of the CIGS film is provided in the CIGS process chamber.

69. (Previously Presented) An in-line production apparatus in accordance with claim 65, wherein the device for detecting the deposited amount of constituents of the CIGS film is an XRF (X-ray fluorescence) device, an EDX (energy dispersion X-ray spectroscopy) device or a profilometer.

70. (Previously Presented) An in-line production apparatus in accordance with claim 66, wherein the additional sensor pairs and associated evaporation sources are arranged in a row at a location between said two rows.
71. (Previously Presented) An in-line production apparatus in accordance with claim 70, wherein one or more additional sensors are connected to an input of the respective controllers, the additional sensors being arranged to measure the physical parameter upstream and/or downstream the reference transition point.
72. (Previously Presented) An in-line production apparatus in accordance with claim 63, wherein the controller is adapted to change the relative amount of Cu versus In+Ga.
73. (Previously Presented) An in-line production apparatus in accordance with claim 63, wherein an x-ray fluorescence composition measurement device is provided in the CIGS process chamber said x-ray fluorescence composition measurement device adapted to measure the total deposited amounts of each element (CU, Ga, In, Se) and thereby the thickness and composition of the deposited CIGS layer.

74. (Previously Presented) An in-line production apparatus in accordance with claim 73, wherein the controller is connected to the x-ray fluorescence composition measurement device and is adapted to adjust the total amount of deposited Cu and/or the total amount of deposited Ga+In in order to keep the thickness of the deposited CIGS layer constant.

Claims 75-79 (Cancelled)

80. (Previously Presented) An in-line continuous substrate flow production apparatus for fabrication of copper indium gallium diselenide (CIGS) solar cells comprising a CIGS process chamber in which substrates provided with a molybdenum back contact layer continuously move through a deposition zone (DZ) in the CIGS process chamber, wherein the process chamber comprises a plurality of separated substrate heaters, evaporation sources with Cu, In, Ga and Se, and source heaters, the sets of evaporation sources provided in rows over the width of a substrate, and at least one composition detection device for detecting the respective amounts of deposited elements in the CIGS at each of the rows, and a controller connected to said at least composition detection device and adapted to adjust the evaporant fluxes in the respective rows in

response to a detected variation in deposited amount of the corresponding element in order to provide a CIGS layer of uniform composition of elements.

81. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein said at least one composition detection device (20) being adapted to measure the deposited amount of constituents of the deposited CIGS film at each of the rows, and said controller being adapted to adjust the evaporant fluxes in the respective rows in order to provide a CIGS film of uniform thickness.

82. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein there are two rows of vapour sources arranged over the width of the process chamber as seen in the transport direction of the substrates, wherein the two rows of evaporation sources are arranged at each side of and outside the path along which substrates flow through the deposition chamber.

83. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80,

wherein said at least one composition detection device is provided within the process chamber.

84. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein said at least one composition detection device is provided outside the process chamber.

85. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein the evaporant vapor sources are arranged at a level below the substrates.

86. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein said at least one composition detection device is a device that measures the composition of the CIGS layer directly.

87. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein said at least one composition detection device is an X-ray fluorescence device and/or an EDX (energy dispersion X-ray spectroscopy) device adapted to measure

the total deposited amounts of each element and thereby also the thickness of the CIGS layer.

88. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein the controller is adapted to receive as input signal a signal representative of the total deposited amounts of each element and in response to said latter signal adjust the fluxes from the evaporant sources in order to provide a uniform thickness of the CIGS film.

89. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein said at least one composition detection device is a device that measures the composition of the CIGS layer indirectly.

90. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein said at least one composition detection device is a resistance measuring device.

91. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein a separate thickness measuring device connected



to the controller for measuring the thickness of the deposited CIGS layer is provided, and the controller is adapted to adjust the fluxes from the evaporant sources to in response to a detected thickness variation in order to provide a CIGS layer of uniform thickness.

92. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 91, wherein thickness measuring device is a profilometer.

93. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein there are evaporant sources with Cu, Ga and In and the evaporant sources are arranged in the following order as seen in the transport direction of a substrate: Ga, Cu, In.

94. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 93, wherein a further evaporation source with Ga arranged downstream the In evaporation source.

95. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 80, wherein there are evaporant sources with Cu, Ga and In

and the evaporation sources are arranged in the following order as seen in the transport direction of a substrate:  
In, Cu, Ga.

96. (Previously Presented) An in-line continuous substrate flow production apparatus in accordance with claim 95, wherein a further evaporation source with In arranged downstream the Ga evaporation source.